Component Performance Studies

1 RISK IMPORTANT SYSTEMS AND COMPONENTS

The component studies look at four specific components: motor-driven pumps, turbine driven pumps, motor-operated valves, and air operated valves. These components are in several systems each (see Table 1). The systems were selected based on risk importance (RI). This report updates NUREGs, *NUREG-1715, Volume 1 through 4*.

Table 1. Component studies component and system cross-reference.

Plant Type	RI System	MDP	TDP	MOV	AOV
PWR	AFW	●	●	●	●
	CCW	●			
	CSS	●		●	
	CVC	●		●	●
	HPI	●		●	●
	ESW	●			
	RCS			●	
	RHR	●		●	●
BWR	ESW	●			
	HCI		●	●	●
	HCS	●		●	
	LCS	●		●	●
	RBC	●			
	RCI		●	●	●
	RHR	●		●	●

2 COMPONENT DESCRIPTIONS AND BOUNDARIES

2.1 MDP Assembly Description and Boundaries

The MDP consists of the pump, motor-driver, and circuit breaker sub-components. All of the pumps are centrifugal, but can be different configurations. The drivers are medium or large ac motors. For most PWRs, the MDP assembly includes a speed increaser, which is treated as a sub-component.

The component boundaries are the MDP assembly, its sub-component, and piece-parts described above, that are supplied as part of the MDP assembly. Other system components, such as pump suction and discharge valves, flow instrumentation and controls, and remote electrical controls, are considered outside the component boundary for the MDP study.

2.2 TDP Assembly Description and Boundaries

The TDP is comprised of a pump, a turbine driver, and a governor. Most plant designs use a single stage “Terry Turbine”, whose piece-parts include a turbine trip and throttle valve, a

mechanical overspeed trip mechanism, and a lubrication system. The various types of governors, used for turbine speed control are mostly manufactured by the Woodward Corporation. For the AFW system TDP, the governors are predominantly mechanical/hydraulic, pressure compensated, and have a pneumatic remote-speed setting capability. For the RCIC and HPCI systems, the TDPs typically have a Woodward type EG-M electric/electronic governor and EGR. Piece-parts of all governors include a turbine stop valve and a governor valve, while the EG-M usually includes a ramp generator/signal converted and other electrical controls.

The component boundaries are the TDP assembly, its sub-component, and piece-parts described above, that are supplied as part of the TDP assembly. Other system components, such as steam inlet valves to the turbine, pump suction and discharge valves, flow instrumentation and controls, and remote electrical controls, are considered outside the component boundary for the TDP study.

2.3 MOV Assembly Description and Boundaries

A MOV assembly consists of a valve body and motor-operated sub-components (excludes the circuit breaker). The valve body is generally a gate type. The motor-operator is generally a Limitorque or a Rotork ac or dc motor actuator.

The MOV component boundaries are the MOV assembly, its sub-components described above, and the piece-parts of the sub-components. The piece-parts of the valve body are the stem, packing, and internals. The motor-operator piece-parts include the torque switch, spring pack, limit switch, wiring/contacts, and motor internal and mechanical devices.

2.4 AOV Assembly Description and Boundaries

An AOV assembly consists of a valve body and pneumatic operator sub-components (excludes the circuit breaker). The valve body is generally a globe or butterfly type. The pneumatic operator is generally a piston or diaphragm type actuator. Main steam isolation valves and power operated relief valves are excluded from the AOV study even though pneumatically operated, as these are valves with different design and operating features.

The AOV component boundaries are the AOV assembly, its sub-components described above, and the piece-parts of the sub-components. The piece-parts of the valve body are the stem, packing, and internals. The pneumatic operator piece-parts may include piston internals/seals or diaphragm, positioner, mechanical linkage, volume booster, pilot valve, bolting, air regulator, airline, and wiring/contacts. Failures associated with instrument air systems that are not integral to the AOV assembly (e.g., contamination from the instrument air system that failed the AOV) are excluded in the AOV analysis.